Case Study:CMS Star Rating of Hospital and Analysis for Provider.

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Problem Understanding

CMS rates hospitals in the US on a scale of 1-5, with the objective of making it easier for patients and consumers to compare the quality of services offered by hospitals.

The Objective of this Analysis are as follows:

- Understanding the Star Rating Methodology and Identify the important Variables affecting the Star Rating.
- Ways to improve the current Star Rating for Evanston Hospital.

Analysis Steps:

The Analysis is divided into four parts:

- Understanding the Data (Groups and Measures)
- Identifying the Important Measures affecting the Star Ratings.
- Predictive Modelling for the Same.
- Provider Analysis: Recommendation to Evanston Hospital to improve their rating.

Data Understanding

CMS Included 62 Measures classified under 7 groups having certain weightage as follows:

Groups:

- Mortality, Patient Experience, Safety of Care, Readmission(22% weightage of groups)
- Timeliness of Care, Effectiveness of care, Medical Imagine Efficiency.(4% weightage of groups).

Measures:

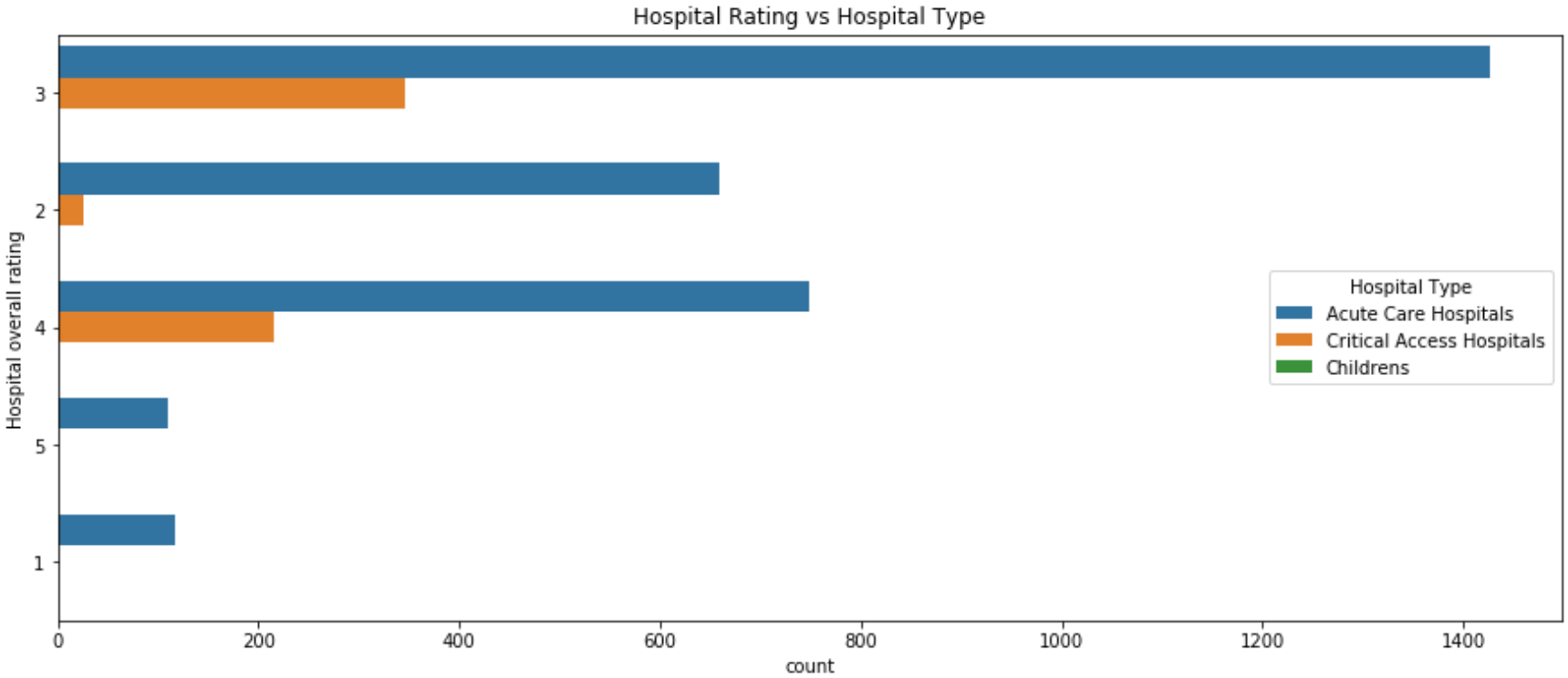
- Positive measures: Patient Given Appropriate Vaccine, Timely Treatment Provided etc.
- Negative Measures: All mortality measures, readmissions measures, timeliness measures.

Data Cleaning

The main quality issues in the data provided by hospital compare are as follows:

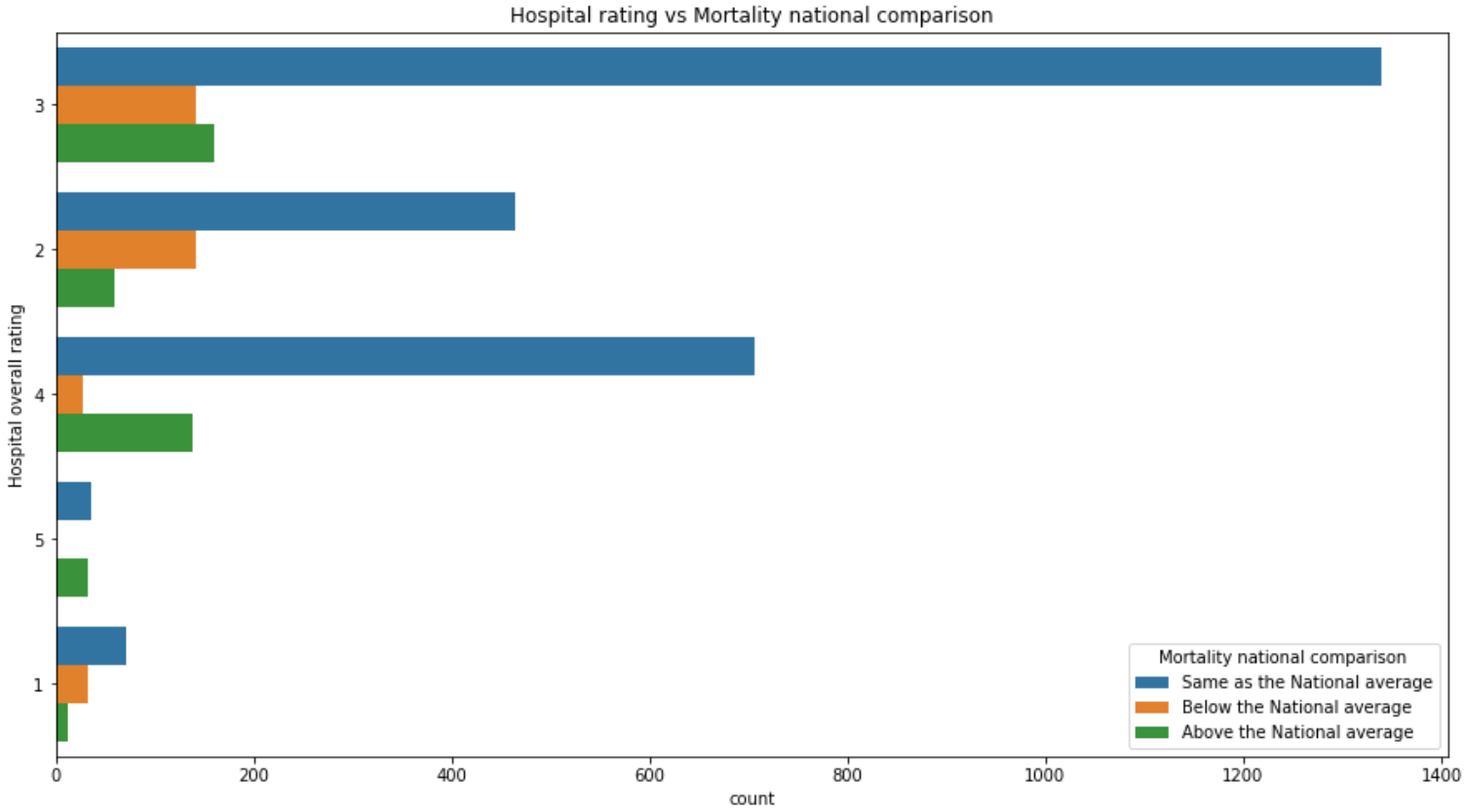
- The data provided is in ‘wide’ format with 55 files which was converted into one long file . This master file’s each row represents a provider and each column a measure.
- Each cell in the master file represents a numeric score of the measure.
- Measures were stnadardised so that higher value indicates better performance.
- Missing values which constitutes about 50 % percent, were imputed as per the guidelines provided by CMS

Distribution of Star Ratings



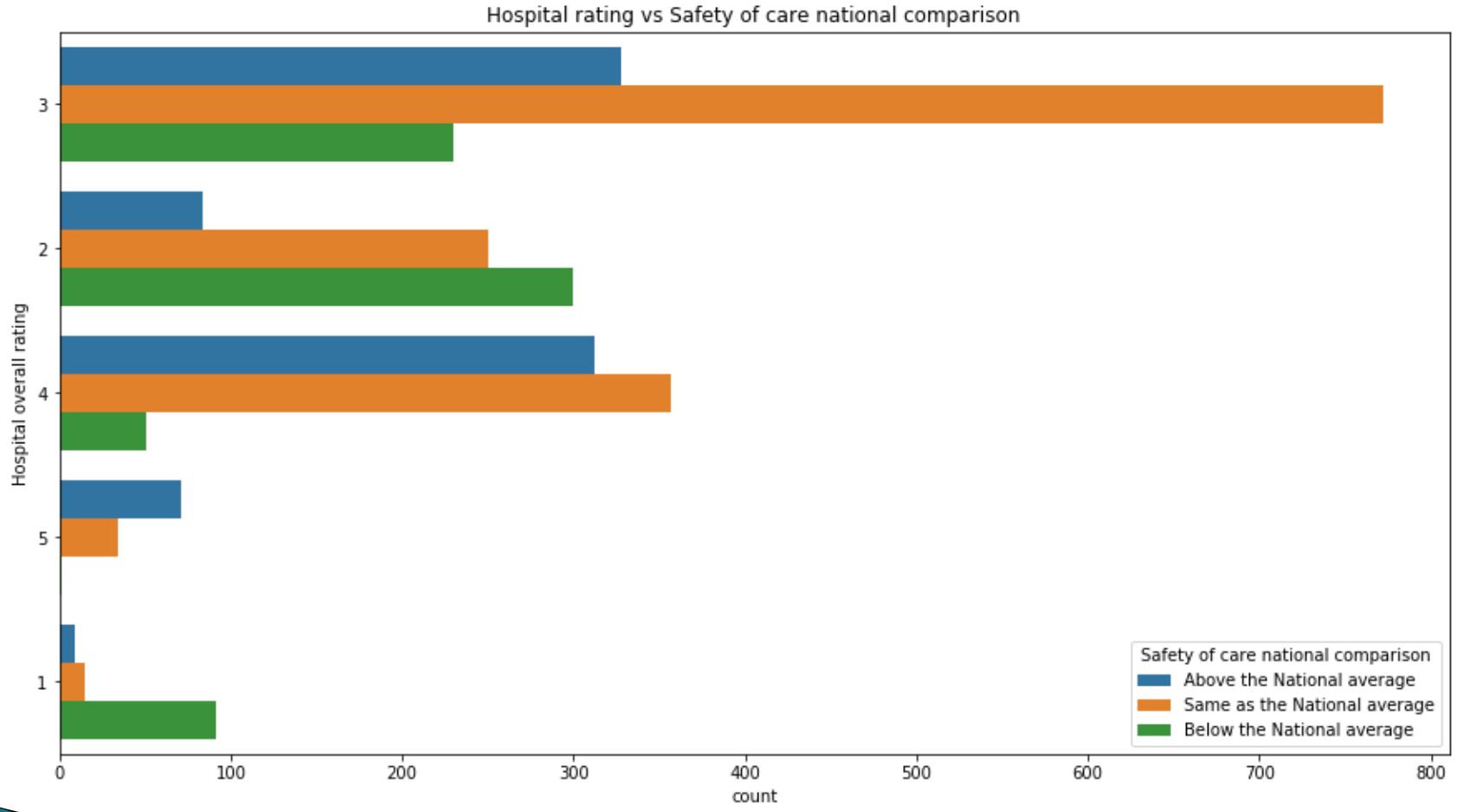
- Data for Hospital Type – Acute Care Hospitals is available more in comparision to other two hospital types.
- Most of the patients gave overall rating of 3
- Least number of patient gave hospital rating of 1 which is then followed by 5

Measures Impacting Star Ratings

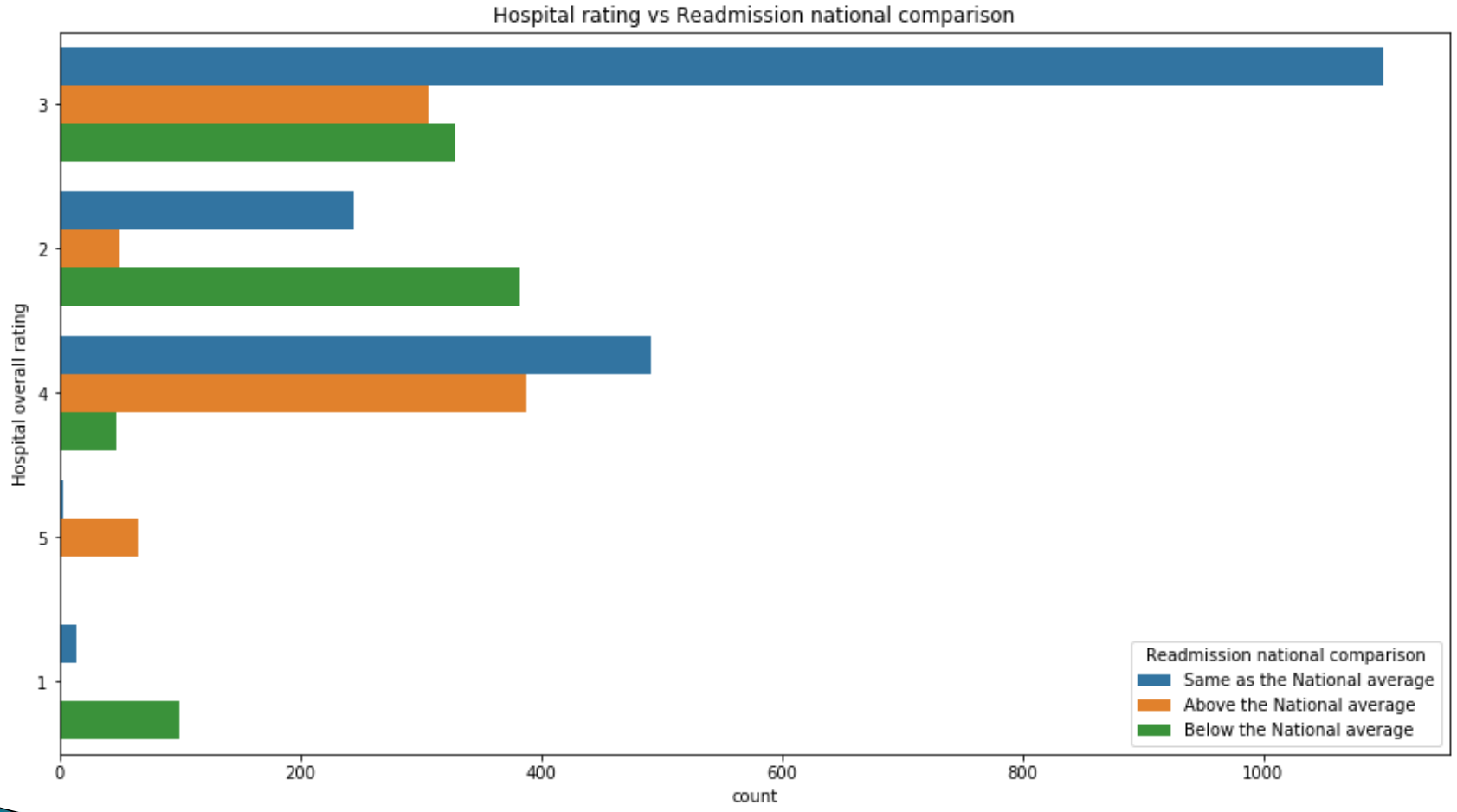


Hospital Rating Vs Mortality National Comparison

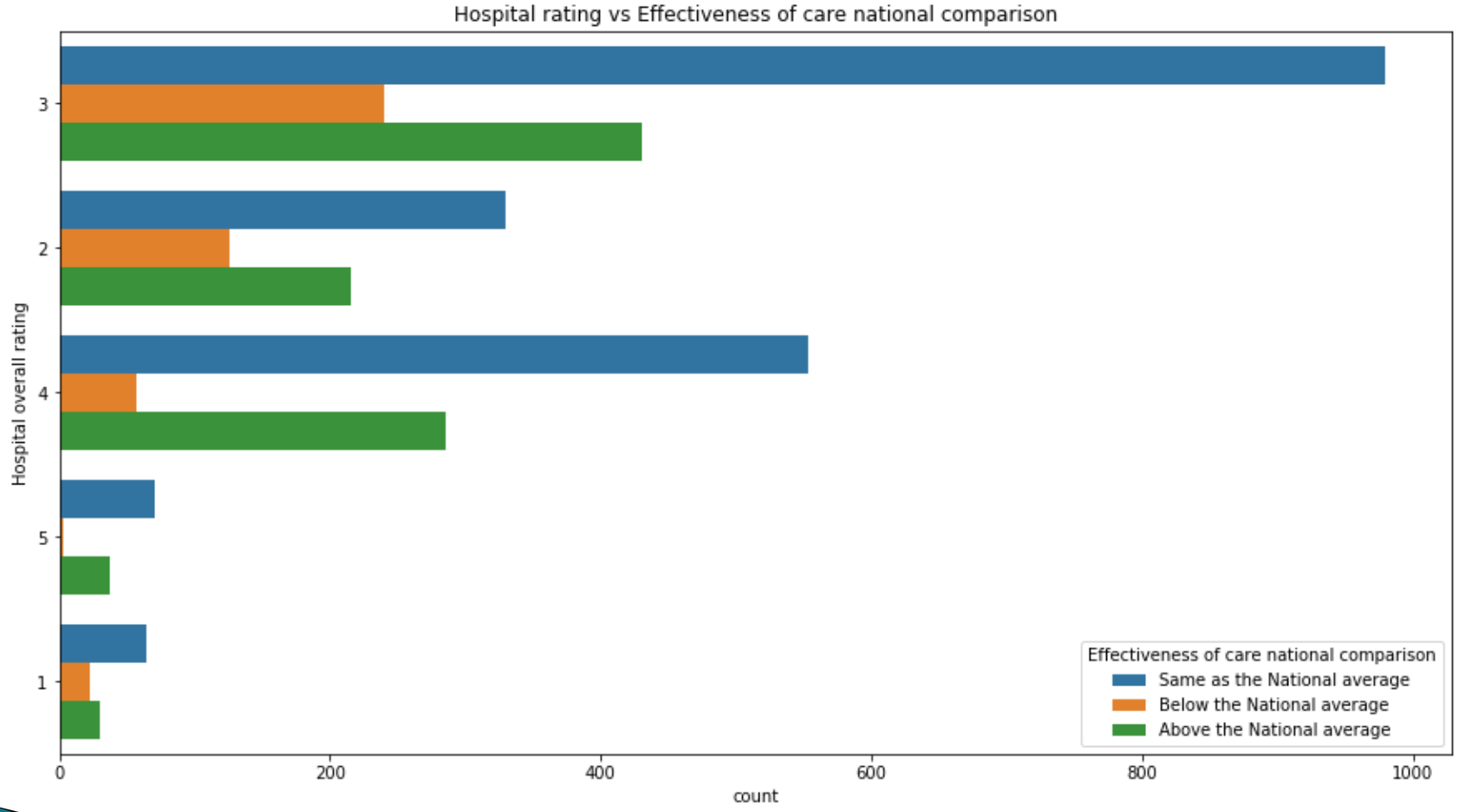
Hospital Rating Vs Safety of Care



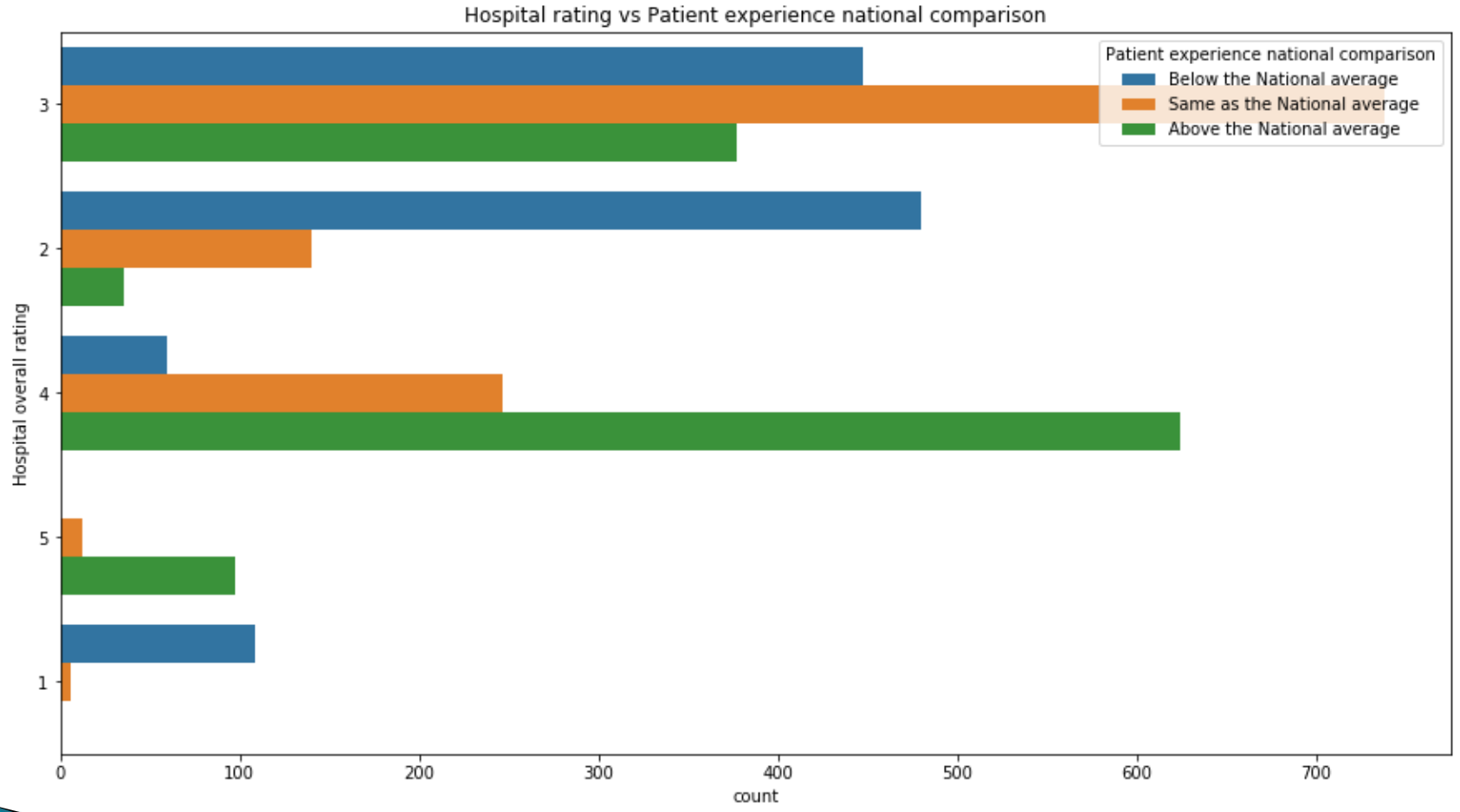
Hospital Rating Vs Readmission



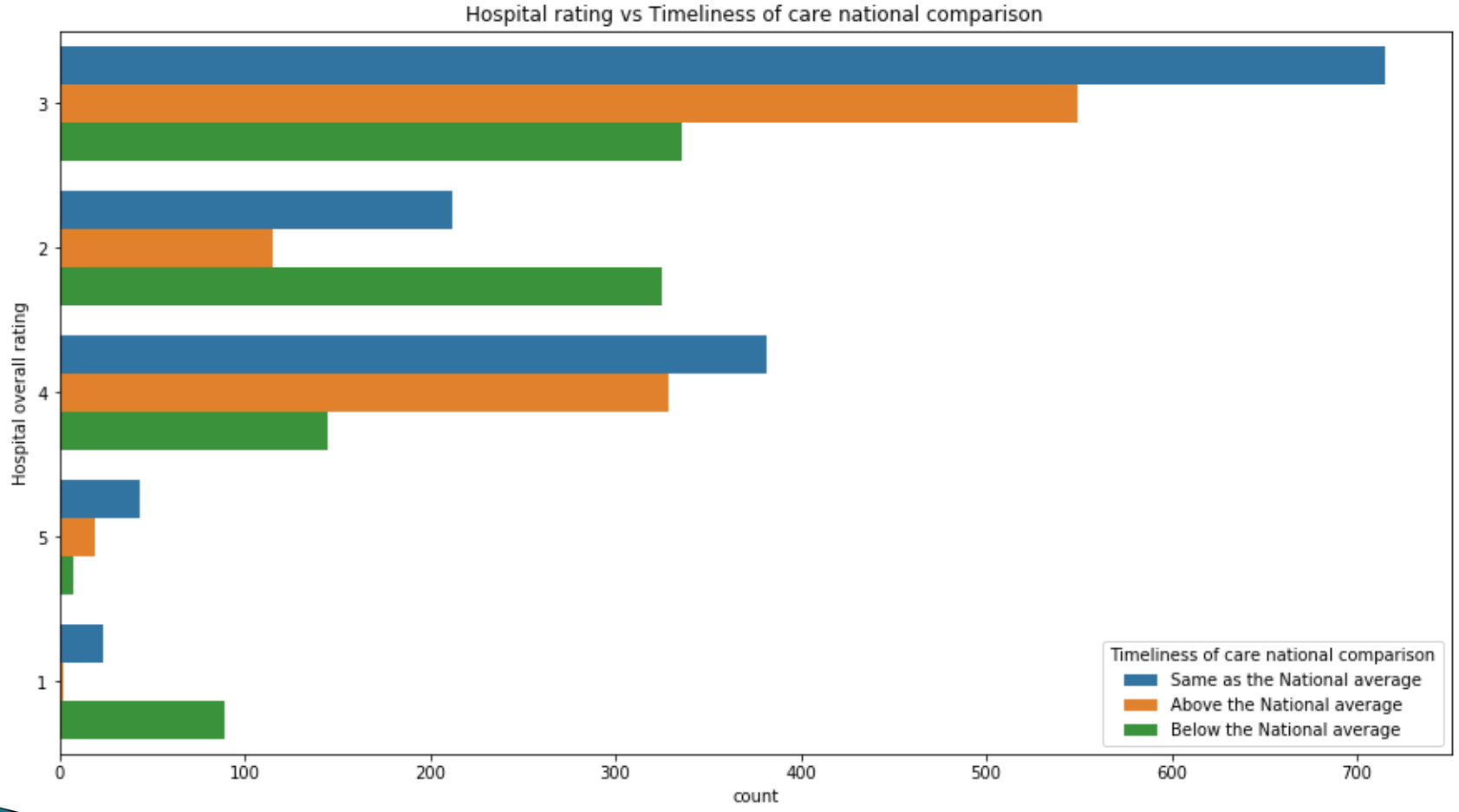
Hospital Rating Vs Effectiveness of Care



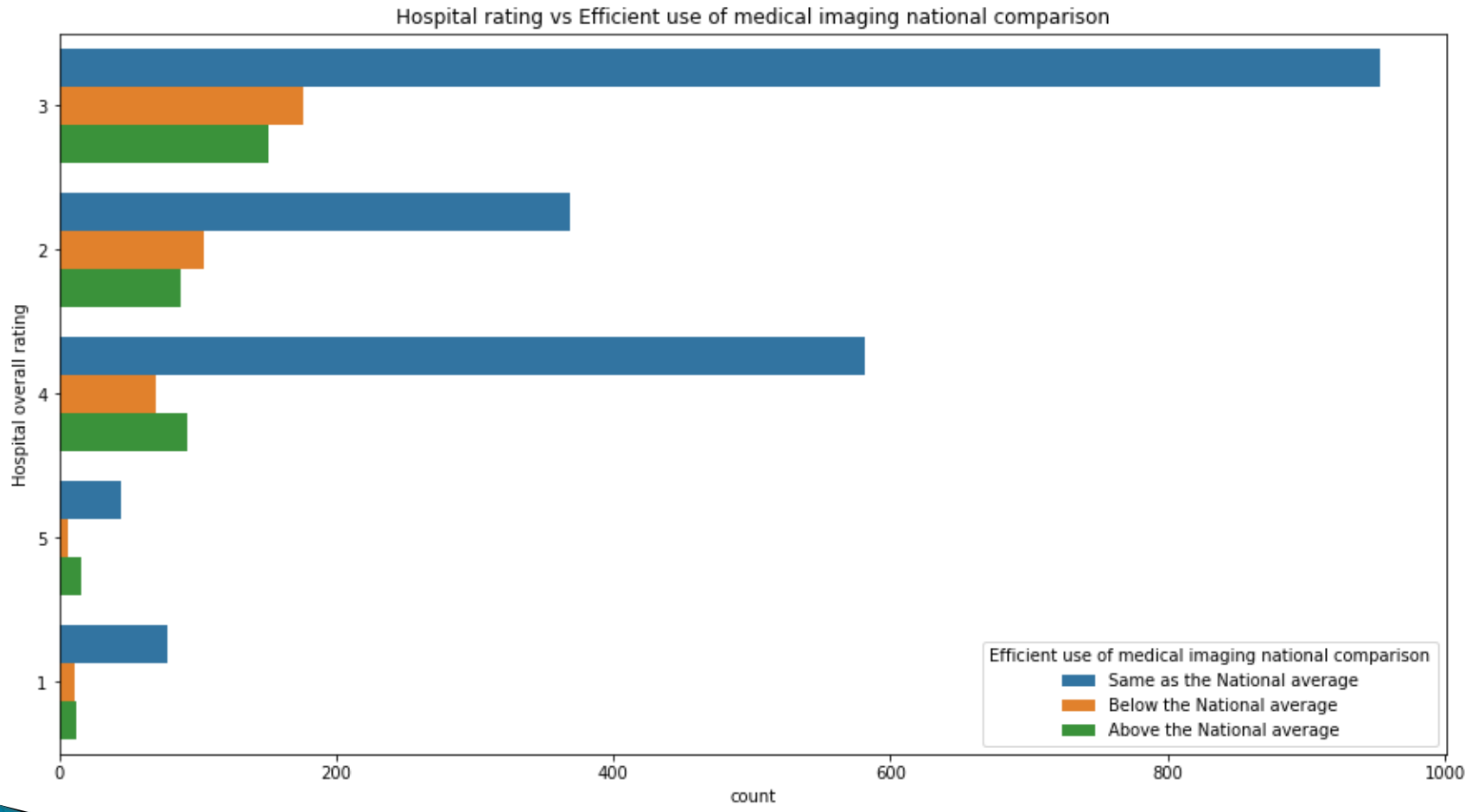
Hospital Rating Vs Patient Experience



Hospital Rating Vs Timeliness of care



Hospital Rating Vs Efficient Use of Medical Imaging



Star Ratings Prediction(Supervised):

Random Forest Predicts Star Ratings with an overall accuracy of approx. 80%:

- Accuracy is between 80-90% for classes 2,3 and 4.
- Accuracy is approx. 70% for ratings 1 and 5.
- All provider ratings are predicted within an error of -1 and +1.

Star Rating Prediction(Unsupervised)

- After Performing Incremental Principal Component Analysis, 45 Components were left.
- Performing Cluster analysis for the same, 33 % of Accuracy was obtained.

Recommendations:

The Key Measures for Improvement are:

- Readmission
- Patient Experience
- Safety